

REMARKS

In response to the Office Action mailed February 25, 2004, Applicant amends his application and requests continued examination.

In this Amendment claims 18, 19, and 20 are amended to correct typographical errors. In claims 18 and 19 an omitted word is added and in claim 20 a word that is singular is made plural in order that, as intended, the next-to-last paragraph of claim 20 is identical to the next-to-last paragraph of claim 14. In addition, claims 14 and 20 are amended to make the invention clearer. The particle size measurement is made for the slurry that is being directly supplied to the polishing apparatus. Claim 15 is amended to ensure consistency with amended claim 14.

Claims 14, 15, and 17-20, all of the pending claims with the exception of claim 16, were rejected as anticipated by Yueh (U.S. Patent 5,791,970). This rejection is respectfully traversed.

The Examiner explained in detail at page 2 of the Office Action his position with respect to the arguments made in the previous response. According to that statement, the argument previously presented "is not persuasive because Yueh describes both measuring a characteristic of slurry as the slurry is being supplied to the processing apparatus and controlling polishing in response to the measured characteristic." Applicant respectfully disagrees with both prongs of this reply. Applicant respectfully notes that the new rejection is for anticipation, meaning that, to be sustainable, every element claimed in the claims rejected must be described in Yueh.

With regard to the first prong of the reply, Applicant agrees that some particle size measurement is made in Yueh but in a way that is not explained in Yueh. Using a "particle size distribution sensor 31", the construction of which is never described in Yueh, a valve 43 is actuated, in a way never described in Yueh, to admit fresh slurry to the tank 29 containing the already used slurry. The mixture of slurries is stirred and the stirred mixed slurry is drawn from the tank 29 using the pump 34 to supply slurry to the polishing apparatus. As discussed below, still more fresh slurry may be added to the slurry drawn from tank 29 before the polishing.

It is apparently the Examiner's view that the undescribed particle size distribution sensor 31 of Yueh, by somehow measuring particle size distribution in the tank 29, measures the particle distribution of the slurry supplied to the polishing apparatus. What is claimed in the independent claims 14 and 20 is measuring particle information of slurry "being supplied to and directly used in the polishing apparatus to polish the object". Considering the function of the particle size distribution sensor 31 of Yueh, and its

interconnection with the valve 43, it is apparent that the measurement being made by Yueh is of the slurry within the tank 29, based upon the condition and amount of used slurry flowing into tank 29. That slurry is not the slurry directly used in polishing an object because Yueh's sensor 31 is not located in the conduit 33 leading to the polishing apparatus. Therefore, the particle size distribution sensor 31 in Yueh does not measure particle information of the slurry being supplied to and directly used in the polishing apparatus. Instead, Yueh's sensor 31 measures some characteristic of whatever inhomogeneous mixture of slurries is present in the tank 29. On that basis, the first prong of the Examiner's reply is not supportable.

Moreover, the slurry drawn from Yueh's tank 29 is not the slurry being supplied to and directly used in polishing in the polishing apparatus. In Yueh, a variable amount of fresh slurry is supplied at valve 49, based upon some magical control by the end point monitor 40. See Yueh at column 3, lines 38-45. Thus, any measurement of particle information in tank 29 would not accurately reflect particle information for the slurry supplied to and directly used in the polisher because there is no particle size sensor in Yueh between the valve 49 and the polishing pad. The contrary assertion ignores the full disclosure of Yueh. Moreover, the absence of any description in Yueh of what variable or variables control the valve 49, and what the objective of that control is, shows that Yueh lacks an enabling disclosure as to determining any particle information of the slurry that is being supplied to and directly used in the polishing apparatus.

Further, Yueh does not contain an enabling disclosure as to the points essential to the rejection and, therefore, cannot properly be considered prior art. See MPEP 2121. There is no description in Yueh of how the controller 41 operates and even less description with regard to the end point monitor 40, which is critical to the Examiner's position with respect to the rejection of the present claims. It is Yueh's end point monitor 40 that controls the valve 49 (and the valve 33, discussed below), which is essential to the propriety of the rejection. The limited description that does appear in Yueh makes reference to a co-pending patent application, concerning the end point monitor, which matured into U.S. Patent 5,865,665. A copy of that patent is supplied in an Information Disclosure Statement to demonstrate that it, likewise, discloses a concept or idea, but not an invention in the fashion required by 35 U.S.C. 112, first paragraph. Even if that other patent is read in combination with Yueh, there is still not an enabling disclosure as to measuring particle information of slurry *being supplied to and directly used for polishing in* the polishing apparatus.

The second prong of the Examiner's reply asserts that Yueh controls polishing in response to the measured characteristic. This basis of this reply is explained at page 3 of

the Office Action. "Polishing speed and time are both controlled since the wafer removal rate is controlled. (Col. 3, Lines 14-22 and Col 3, Lines 38-44). This rate is polishing speed, which is a function of polishing time."

Careful attention to the actual disclosure in the cited portions of Yueh shows that disclosure has been read into Yueh that is not present in Yueh, resulting in an erroneous rejection. The passage in lines 14-22, column 3 of Yueh refers to a valve 35. That valve connects a tube 26 through which the used slurry collected from the polishing apparatus flows to cartridge filters 27 and transverse filter 28. The function and structure of those filters is never described by Yueh. According to the first passage of Yueh cited in the Office Action, the valve 35 is controlled by the end point monitoring system 40 described in the attached U.S. Patent 5,865,665. The valve 35 passes an amount of used slurry that is a function of an instantaneous wafer removal rate. "That is to say, when the removal rate is high, a greater amount of particulate matter is present in the slurry and more slurry is disposed of with less slurry being passed by the valve [35]." The clear implication of this cited passage is that the valve 35 does not discharge all of the collected slurry into the filters 27 and 28 but apparently somehow disposes of some of the slurry if the slurry contains too much particulate material. However, there is no description in Yueh, either in the text or in the figures, indicating disposal of any slurry or of any discharge vent or opening. This omission further demonstrates the failure of Yueh to present an enabling disclosure as to this point and reinforces the fact that Yueh cannot be considered prior art.

The first cited passage from column 3 of Yueh describes controlling a valve in order to reach an end point of a polishing process and refers to an instantaneous removal rate that is obviously a calculated variable. There is no reference in this cited passage to polishing speed nor polishing time. Applicant readily agrees that both factors (speed and time) are important in considering whether an end point of a polishing process has been reached. However, that simple fact does not relate to controlling polishing speed based upon particle information, i.e., dispersion of particles and distribution of particle sizes, in the slurry that is being supplied to and directly used in the polishing process. There is no description of measuring and using particle information for that purpose in Yueh or in the attached U.S. Patent 5,865,665 concerning the end point monitoring apparatus and no such discussion in the first of the cited passages.

Put another way, the first passage of Yueh cited in the rejection states that one can determine that the removal rate of material from an object being polished is high when a large amount of particulate material is present, not in the slurry being supplied to the polishing apparatus, but in the slurry being *discharged* from the polishing apparatus. According to the present invention, the polishing process is controlled with respect to

polishing speed (claim 14) and polishing time (claim 20) based upon particle information that is measured from the slurry being *supplied to and directly used in polishing an object* in the polishing apparatus. This method plans in advance the polishing process whereas the cited passage from Yueh describes what can be determined about the polishing process from measuring the discharged slurry, i.e., after the polishing process. Thus, the first passage from Yueh cited in the Office Action does not support the proposition for which it was cited.

Lines 38-44 in column 3 of Yueh, the second passage cited in the Office Action, describes controlling the valve 49. Apparently that valve 49 determines whether the fresh slurry supply, or the mixture of fresh and used slurry from the tank 29, is supplied via the pipe 34 to the polishing apparatus or whether still a second mixture is made of partially recycled slurry and fresh slurry. This valve 49 is controlled by the mysterious end point monitoring system 40 of Yueh, the system that is allegedly described in U.S. Patent 5,865,665, based upon instantaneous wafer thickness information. As noted in the cited passage of Yueh, the end point monitoring system also obtains wafer removal rate data, apparently from the particulate content of the used slurry, in order to control the valve 35, already described above. The seven lines from column 3 of Yueh cited by the Examiner make clear that the mixture of slurries provided to the polishing apparatus is based upon an instantaneous wafer thickness calculation, not any measured particle information of the slurry being supplied. That unexplained calculation, referenced in U.S. Patent 5,865,665, does not involve using "particle information" as that term is defined in the pending claims.

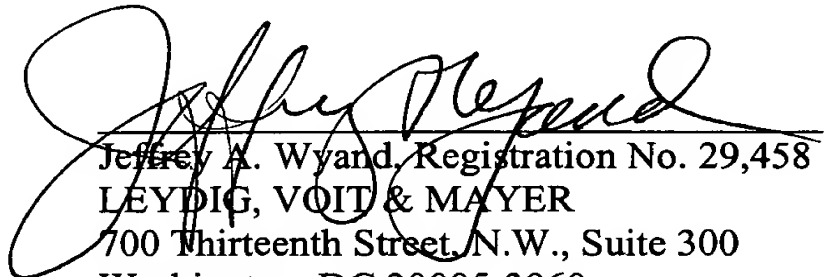
The rejection requires a very careful analysis of Yueh because of the very limited detail of the disclosure of that patent. There is simply nothing in Yueh, for the reasons described in detail above, that even suggests controlling either a polishing speed or polishing time based upon particle information, particularly with respect to input slurry directly used in a polishing process. What seems to be described by Yueh, although one of skill in the art cannot be certain, is adjusting the proportion of fresh slurry added and used slurry discarded, based upon an end point determination, related to the amount of particulate matter in slurry expelled from a polishing process, in conjunction with a mysterious instantaneous thickness calculation. Whatever Yueh discloses, it is not the invention claimed here. Therefore, upon reconsideration, the rejection for anticipation of claims 14, 15, and 17-20 should be withdrawn.

Claim 16 was rejected as unpatentable over Yueh in view of Shelton (U.S. Patent 6,383,332). This rejection is respectfully traversed.

Assuming, for the sake of argument, that Shelton stands for the proposition for which it was cited, Shelton does not supply the elements of the other claims, particularly independent claims 14 and 20, that are missing from Yueh. Since the rejection of claim 16 as obvious is founded upon the assertion that claim 14 is anticipated by Yueh, and that foundation is erroneous, the rejection of claim 16 should be withdrawn along with the withdrawal of the rejection for anticipation of the other pending claims.

For the foregoing reasons, all claims now pending should be allowed.

Respectfully submitted,


Jeffrey A. Wyand, Registration No. 29,458
LEYDIG, VOIT & MAYER
700 Thirteenth Street, N.W., Suite 300
Washington, DC 20005-3960
(202) 737-6770 (telephone)
(202) 737-6776 (facsimile)

Date: May 14, 2004
JAW:ves